Downloading data directly from space

Earth Information company creates a new industry standard in space data analytics powered by HPC solutions and services from R Systems and Dell Technologies.

spire

Atmospheric Science | **United States**

Business needs

Spire needs simplified access to high performance computing systems that can process a myriad of data captured by a global constellation of satellites and ground stations at lightning-fast speed.

Solutions at a glance

- Dell Technologies OEM Engineered Solution with R-Systems
- HPC Managed Services from R Systems, a Dell Technologies partner
- Bare-metal compute clusters with Dell EMC PowerEdge Servers
- Dell EMC PowerSwitch, and InfiniBand networking
- Parallel file systems

Business results

- Make data from space accessible in near-real time
- Providing advanced maritime, aviation and weather tracking
- Delivering new ways to empower accurate weather data to customers around the world
- Capitalizing on pay-as-you-go HPC Managed Services

Spire Global was founded in 2012 on the principle that **data from space change the world**

With global operations and groundstations, Spire maintains 24/7 coverage of **every corner of the entire Earth**

Covering the Earth, 24/7, 365

When they launched the company in 2012, the founders of Spire Global, Inc., mapped out a plan to build and manage a global network of groundstations and a constellation of nanosatellites. These satellites collect data about the earth and beyond as part of Spire's stated mission to inspire, lead and create the business of Earth observation for the benefit of all.

Today, Spire is one of the largest and most trusted space-to-cloud analytics companies with operations and customers all over the world. In the course of its business, the company uses proprietary satellite data and algorithms to provide what is arguably the most advanced maritime, aviation and weather tracking in the world. This year, the US Air Force and ECMWF are using Spire data to augment its operational forecast during Covid-19. In addition, Spire won the 2020 Small Business Innovation Partner award from ESRI, and was selected by ESA to provide its data through the EarthNet program in 2020.

Spire's data analytics is backed by a wholly owned and developed constellation of nanosatellites, a global ground station network, and 24/7 operations that provide near real-time global coverage of every point on Earth. Spire designs, develops, builds and tests all of its space technology and predictive analytics in-house. The satellites are then placed in low Earth orbit where Spire operates them and regularly upgrades them with new software, just as the company does with its science and analytics software on the ground. The sophistication and flexibility of these modern satellites allows Spire to achieve unprecedented coverage and resolution with its services at a compelling price point for the customer.

"Even though a Satellite goes around the earth every hour and a half, it doesn't mean you see the whole world every hour and a half. This one satellite travels around and it's going to see this target, but it's not going to see it again until that target's rotated it all the way around to the other side 12 hours later. And that could be a long 12 hours. We need to be able to replace this capability and that's what we think you can do with CubeSats. So the idea is, instead of having one single satellite, you have a constellation or a fleet. This shows that by having lots of satellites in different places, you can see how you have a greater view of the planet. So this particular target that you're interested in, you now see very, very frequently. That's what Spire has proven you can do with CubeSats."

*– Joel Spark,
    Spire Chief Satellite Architect & Co-Founder, Spire Global*

Enabling Data to power more accurate weather forecasts

"Spire has been busy signing strategic partnerships in 2020, including deals with NASA, the European Space Agency and Amazon, along with "key global players" that operate in the weather, maritime and aviation sectors."
Forbes Science October 2020

In its work to capture data from space, Spire is taking advantage of a wide range of new technologies that have become available in recent years to build relatively inexpensive satellites. Spire put these satellites into orbit to do things that people used to be able to do only with billion- or multibillion-dollar satellites that are the size of a school bus, according to Thomas Henderson, senior director for software engineering at Spire.

A major focus for the company is supporting the 'pillars of infrastructure" behind weather forecasting, Henderson says. In particular, Spire strives to provide its customers with more granular and more accurate Earth information to inform forecasts. To make this happen, Spire uses a scientific technique called radio occultation. This technique allows scientists to observe and measure atmospheric properties, such as temperature, pressure and water vapor, with a high degree of accuracy.

"In the weather business, we use radio occultation data from our satellites to improve the forecasts that the computer weather forecast models make," Henderson says. "We take our data, which is unique, and we feed it into the weather models. And if the weather models have a better idea of what the current weather is, which is what our observations do, then they can make a better prediction of what the future weather is going to be. And that's something that offers a lot of value to our customers."

Spire's target customers include maritime, aviation, agricultural and mining companies, along with government agencies. While they have different goals in mind, all of the company's customers benefit from access to accurate information gained from data captured in space. Merchant shipping companies, for example, use information from Spire to route ships to avoid storms and winds blowing in the wrong direction. This better routing can help shipping companies save money on fuel and get cargo to ports safely.

In 2020, NASA signed a contract to receive Spire weather data operationally, a world first. ECMWF and ESA have purchased their data for detailed impact analysis. UK Met Office and US Air Force are using Spire data to improve operational forecasts.

DELLTechnologies

Leading global shipping company Oldendorf is using Spire's AIS maritime data and predictive analytics to reduce fuel cost, reasoning that "If we only save 1% of fuel on every trip every day, we could significantly reduce our CO_2 emissions.' TTEK uses Spire's ADS-B flight-tracking and related data to risk-assess flights entering or leaving sovereign territories and airspace, stating that "Spire Aviation data is a key component for TTEK clients who require clear visibility into the aviation risk landscape."

"The biggest generational challenge we face as a people is climate change and how it impacts our weather."
— Spire CEO, Peter Platzer

Working with R Systems

To carry out its ambitious mission, Spire requires leading-edge high performance computing systems that can process large amounts of data at lightning-fast speed. To meet this need, Spire leverages HPC Managed Services from R Systems, a Dell Technologies partner. These cloud-based services give Spire's engineers and data scientists untethered access to best-in-breed technologies, including bare-metal clusters, InfiniBand networking, parallel file systems, and other computing technologies.

"Spire is a space-driven data company and data services, data products company. I sometimes joke that we're just a data company. We've got the competitive advantage of having our own in-house space program. We do build and launch and operate satellites. Our whole business model is driven around data from space, augmenting life on Earth, and improving life on Earth. We don't do any imagery. We focus on listening to all kinds of signals from space. Ship tracking, aircraft tracking, weather data, ionosphere data."

— Jeroen Cappaert
  Spire CTO & Co-Founder, Spire Global

The power of two:
R Systems and Dell Technologies

In its choice of technology partners, Spire is benefitting from R Systems' close relationship with Dell Technologies. R Systems provides HPC resources and technical expertise to commercial and institutional research clients through R Systems. In addition to those industry-standard solutions, R Systems engineers assist clients in selecting the components of their optimal cluster configurations.

The HPC Managed Services remotely run Spire's advanced numerical weather predictions initialized with the radio occultation data collected by the company's satellites. The combination of this unique data and powerful HPC systems allows Spire to deliver high-quality weather prediction services to its customers in weather-sensitive markets.

R Systems provides a fully managed HPC-as-a-Service solution that encompasses all of the needed computing equipment and software infrastructure, along with HPC support personnel, to accelerate Spire's computing workloads. By leveraging R Systems HPC services, Spire can focus solely on helping its customers manage their weather risks without the complexities of designing, managing, and maintaining HPC infrastructure and staff.

"We're not building a giant data center," Henderson says. "We're operating with a company like R Systems on a smaller scale to basically stand on the shoulders of giants. Our job is to add value."

At the same time, the HPC Managed Services model from R Systems is helping Spire grow its business on its own timelines and budgets.

"By using R Systems, we were able to avoid making a large up-front investment in a fixed-sized HPC system that we would not have been able to fully utilize due to our 'bursty' usage patterns," Henderson says. "In addition, R Systems was able to customize its contracts to match the organic growth of a global startup. This in turn has allowed us to spend more time on maximizing customer benefit from our solutions."
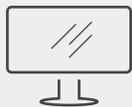
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